

Assignment 3

Number Systems

Textbook Assignment: Chapter 5

Learning Objective:

Identify structure and characteristics of number systems having various bases.

● In items 3-1 through 3-58, numbers without a subscript indicating a particular base are written in the decimal system (base ten) unless otherwise indicated.

3-1. What is the radix in a senary system?

1. 6
2. 7
3. 9
4. 16

3-2. The expression $3(10)^3 + 0(10)^2 + 1(10)^1 + 1(10)^0$ is a representation by positional values of

1. 3010
2. 3011
3. 27010
4. 30010

3-3. The polynomial form of 543 is

1. $500 + 43$
2. $5 + 4 + 3$
3. $(5 \times 3) + (4 \times 2) + (3 \times 1)$
4. $5(10)^2 + 4(10)^1 + 3(10)^0$

3-4. What is the largest probable system formed by using only the digits 0, 1, and 2? (The greatest digit in the number system with base n is n-1)

1. Binary
2. Ternary
3. Quaternary
4. Quinary

6 ⁵	6 ⁴	6 ³	6 ²	6 ¹	6 ⁰
0	0	5	4	2	3

Figure 3A.--Number System

● When answering items 3-5 and 3-6 refer to figure 3A and consider characteristics of the number system represented.

3-5. What is the radix of the number system?

1. 6
2. 4
3. 3
4. 2

3-6. What is the value of the digit 4?

1. 4
2. $(4^6)^2$
3. 4×6^2
4. 6×4^2

3-7. The expression, $a(7)^2 + a(7)^1 + a(7)^0$, is a representation by place values of

1. 210_a
2. 210_7
3. 777_a
4. aaa_7

3-8. Which of the following is a characteristic of a vicenary system (base 20)?

1. The radix is two.
2. The number 20 is a digit of the system.
3. The number 12 is not a digit of the system.
4. Ten more symbols are needed than are used in the decimal system.

3-9. The number B3BD₁₆ means

1. $B(16)^3 + B(16)^2 + 3(16)^1 + D(16)^0$
2. $B(16)^3 + 3(16)^2 + B(16)^1 + D(16)^0$
3. $B(16)^4 + 3(16)^3 + B(16)^2 + D(16)^1$
4. $B(16)^3 + B(16)^2 + D(16)^1 + 3(16)^0$

Learning Objective:

Perform addition and subtraction in various number systems.

When answering items 3-10 through 3-20, perform the indicated operation.

3-10. $411_5 + 434_5 =$

1. 800_5
2. 845_5
3. 1400_5
4. 2310_5

3-11. $310_5 + 422_5 + 121_5 + 242_5 =$

1. 1095_5
2. 1200_5
3. 2150_5
4. 2200_5

3-12. $1110_2 + 1011_2 =$

1. 1111_2
2. 10001_2
3. 11001_2
4. 11111_2

3-13. $741_8 + 642_8 =$

1. 1383_8
2. 1403_8
3. 1583_8
4. 1603_8

3-14. $386t_{12} + et4t_{12} =$

1. $116e8_{12}$
2. $136e8_{12}$
3. 11710_{12}
4. 13610_{12}

3-15. In base 16; if A = 10, B = 11, C = 12, D = 13, E = 14 and F = 15, then

$CDF_{16} + BCA_{16} =$

1. $17A9_{16}$
2. 1809_{16}
3. $18A9_{16}$
4. 2355_{16}

3-16. $2321_5 - 413_5 =$

1. 1403_5
2. 1408_5
3. 1903_5
4. 1908_5

3-17. $11010_2 - 101_2 =$

1. 10101_2
2. 10111_2
3. 11001_2
4. 11111_2

3-18. $7521_8 - 3546_8 =$

1. 3785_8
2. 3783_8
3. 3775_8
4. 3753_8

3-19. $t91e_{12} - 8e21_{12} =$

1. $189t_{12}$
2. $18et_{12}$
3. $199t_{12}$
4. $19et_{12}$

3-20. $CAFE_{16} - BEAD_{16} =$

1. $0C41_{16}$
2. $0C51_{16}$
3. 1241_{16}
4. 1251_{16}

Learning Objective:

Recognize characteristics of complements and use complements in solving problems.

3-21. If a = the number, b = the complement, and c = the reference power, which equation describes subtraction by complements?

1. $a + b = c$
2. $a - b = c$
3. $a + c = b$
4. $b + c = a$

3-22. Which statement is true concerning subtraction by complements?

1. The true remainder of the apparent remainder 0562 is -562.
2. The true remainder of the apparent remainder 0743 is -257.
3. The true remainder of the apparent remainder 1432 is -432.
4. The true remainder of the apparent remainder 1652 is +348.

3-23. In the binary system, what is the two's complement of zero?

1. 0
2. 1_2
3. 10_2
4. 11_2

3-24. What is the two's complement of 10101_2 ?

1. 01010_2
2. 01011_2
3. 01100_2
4. 11011_2

3-25. Subtract 1010_2 from 1000_2 using complements

1. -0010_2
2. -0011_2
3. -0110_2
4. -0111_2

Learning Objective:

Perform multiplication and division in various number systems.

● When answering items 3-26 through 3-35, perform the indicated operation.

3-26. $324_5 \times 242_5 =$

1. 201113_5
2. 233243_5
3. 236443_5
4. 238223_5

3-27. $1110_2 \times 101_2 =$

1. 100110_2
2. 1000110_2
3. 1001110_2
4. 1010110_2

3-28. $542_8 \times 42_8 =$

1. 22764_8
2. 25344_8
3. 27404_8
4. 29424_8

3-29. $e6_{12} \times te_{12} =$

1. $t456_{12}$
2. $t566_{12}$
3. $e366_{12}$
4. $e456_{12}$

3-30. $BAD_{16} \times AD_{16} =$

1. 79369_{16}
2. $7C8D9_{16}$
3. $7E3E9_{16}$
4. $7E429_{16}$

3-31. $4213_5 + 3_5 =$

1. 1112_5
2. 1211_5
3. 1221_5
4. 1222_5

3-32. $2046_8 + 11_8 =$

1. 162_8
2. 166_8
3. 186_8
4. 189_8

3-33. $1000010_2 + 110_2 =$

1. 1111_2
2. 1110_2
3. 1010_2
4. 1011_2

3-34. $7tee7_{12} + 5_{12} =$

1. 16452_{12}
2. $16t34_{12}$
3. $16e74_{12}$
4. $16eee_{12}$

3-35. $BEE_{16} + 6_{16} =$

1. $1FD_{16}$
2. $1C8_{16}$
3. $1A9_{16}$
4. 192_{16}

Learning Objective:

Given various number systems, convert to other specified number systems.

3-36. Convert ACE_{16} to the decimal system by use of the polynomial form.

1. 24,322
2. 8,944
3. 4,288
4. 2,766

3-37. Convert 7422_{12} to the decimal system by synthetic substitution.

1. 13,194
2. 12,892
3. 12,698
4. 10,488

- 3-38. When converting ABC_{16} to the decimal system by use of repeated division where the remainders indicate the decimal equivalent, the dividends are divided by
1. A
 2. ABC
 3. 10
 4. 16
- 3-39. Convert 6456_{12} to the decimal system by use of repeated division where the remainders indicate the decimal equivalent. The second quotient equals
1. 72
 2. 84
 3. 88
 4. 92
- 3-40. What is the order of remainders (resulting from repeated division) which represent 6456_{12} in the decimal system?
1. 1011
 2. 11010
 3. 11101
 4. 11110
- Convert the decimal to the given non-decimal in items 3-41 through 3-45.
- 3-41. Convert 415 to base five.
1. 270_5
 2. 2450_5
 3. 3130_5
 4. 3490_5
- 3-42. Convert 1212 to base eight.
1. 2247_8
 2. 2274_8
 3. 2427_8
 4. 2472_8
- 3-43. Convert 12468 to base 12.
1. 7207_{12}
 2. 7270_{12}
 3. 7702_{12}
 4. 7720_{12}
- 3-44. Convert 24862 to base 16.
1. $611E_{16}$
 2. $61E1_{16}$
 3. $6E11_{16}$
 4. $E116_{16}$
- 3-45. Convert 69 to base 2.
1. 1000101_2
 2. 1000110_2
 3. 1001001_2
 4. 1001100_2
- 3-46. Convert 642_{12} to the base eight by going through base ten.
1. 1226_8
 2. 1262_8
 3. 1622_8
 4. 2621_8
- 3-47. Convert 2342_5 to the base twelve without going through base ten.
1. $21e_{12}$
 2. $24e_{12}$
 3. $2e4_{12}$
 4. $e42_{12}$
- 3-48. Convert 234_5 to base two without going through base ten.
1. 1000011_2
 2. 1000101_2
 3. 1000110_2
 4. 1001001_2
- 3-49. Convert 452_8 to base twelve by the explosion method.
1. $3t0_{12}$
 2. $2t0_{12}$
 3. $20t_{12}$
 4. 222_{12}
- 3-50. Convert $CA2_{16}$ to base five by the explosion method.
1. 100441_5
 2. 100440_5
 3. 100414_5
 4. 100404_5
- 3-51. Separate 1101101_2 into groups for converting to base eight.
1. 110 110 100
 2. 110 110 001
 3. 110 001 101
 4. 001 101 10
- 3-52. Convert 110001111_2 to base sixteen.
1. $18F_{16}$
 2. 189_{16}
 3. 149_{16}
 4. 114_{16}

3-53. Convert 471_8 to base two.

1. 100011101_2
2. 100110101_2
3. 100111001_2
4. 100111011_2

3-54. Convert 84 to the Binary Coded Decimal (BCD).

1. 1100
2. 10000100
3. 10000101
4. 10010100

3-55. Convert the Binary Coded Decimal 011101000010 to a decimal.

1. 343
2. 742
3. 743
4. 752

3-56. A disadvantage of the BCD is that the code does not provide a "decimal" carry.

3-57. Add 18 and 43 in the excess three code.

1. 0100 0100
2. 1000 0010
3. 1001 0100
4. 1100 0010

3-58. Find the nines complement of 3 in the excess three code.

1. 0111
2. 1000
3. 1001
4. 1010